DIVISION OF HIGHWAYS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

SUBDIVISION ROADS

JULY 1, 1985

MINIMUM CONSTRUCTION STANDARDS

GARLAND B. GARRETT JR.
SECRETARY

DIVISION OF HIGHWAYS
BOARD OF TRANSPORTATION

SUBDIVISION ROADS

MINIMUM CONSTRUCTION STANDARDS

July 1, 1985

GARLAND B. GARRET JR.
SECRETARY OF THE DEPARTMENT OF TRANSPORTATION
TELEPHONE (919) 733-2520
RALEIGH, NORTH CAROLINA

LARRY GOODE, PhD., P.E.
STATE HIGHWAY ADMINISTRATOR
TELEPHONE (919) 733-7384
RALEIGH, NORTH CAROLINA

JACK MURDOCK
ASST. SECRETARY FOR SECONDARY
ROADS & ECONOMIC DEVELOPMENT
TELEPHONE (919) 733-3250
RALEIGH, NORTH CAROLINA

TABLE OF CONTENTS

NORTH CAROLINA BOARD OF TRANSPORTATION

MEMBER	DIVISION & COUNTIES REPRESENTED
Charles Ward Route 5, Box 164 Hertford, N.C. 27944 (919) 426-5716 (B) (919) 426-5936 (R) Fax (919) 426-8351	Division 1 Bertie, Hertford, Hyde, Martin, Northampton, Gates, Currituck, Dare, Tyrrell, Pasquotank, Chowan Perquimans, Washington, Camden
Bob Mattocks P.O. Box 156 Pollocksville, N.C. 28573 (919) 224-8911 (B) (919) 633-6644 (R) Fax (919) 224-1443	Division 2 Beaufort, Carteret, Craven, Greene, Lenoir, Jones, Pamlico, Pitt
Odell Williamson No. 2 Causeway Ocean Isle, N.C. 28469 (910) 579-6222 (B) (910) 579-6555 (R) Fax (910) 579-7303	Division 3 Brunswick, Duplin, New Hanover, Onslow, Pender, Sampson
Clark Jenkins P.O. Box 250 Tarboro, N.C. 27886 (919) 823-2101 (B) (919) 823-1769 (R) Fax (919) 641-9234	Division 4 Johnston, Nash, Wilson, Halifax, Edgecombe
Durwood Stephenson P.O. Box 1187 Smithfield, N.C. 27577 (919) 934-6651 (B) (919) 934-6456 (R) Fax (919) 934-4055	At-Large (Air Cargo) Wayne
Carolyn Grant 8121 Brownleigh Road Raleigh, N.C. 27612 (919) 881-9814 (B) (919) 782-0800 (R) Fax (919) 881-2673	Division 5 Durham, Wake, Franklin, Granville, Person, Vance, Warren

Juanita D. Shearer-Swink, ASLA 825 Babock Court Raleigh, N.C. 27609 (919) 406-1710 (B) (919) 510-4218 (R) Fax (919) 990-9127	At-Large (Assist with Wake, Durham)
Thomas Darden 702 Oberlin Road Raleigh, N.C. 27605 (919) 743-2506 (B) (919) 782-9523 (R) Fax (919) 743-2501	At-Large
Lyndo Tippett 509 Valley Road Fayetteville, N.C. 28305 (910) 323-5544 (B) (910) 484-5280 (R) Fax (910) 323-5792	Division 6 Harnett, Cumberland, Bladen, Robeson, Columbus
Major David Green Route 1, Box 178 J Parkton, N.C. 28371 (910) 858-3826 (B) (910) 858-3874 (R) Fax (910) 858-3005	At-Large Robeson, Columbus
J. Douglas Galyon P.O. Box 26969 Greensboro, N.C. 27419 (910) 316-4208 (B) (910) 292-1837 (R) Fax (910) 316-4056	Division 7 Alamance, Caswell, Guilford, Rockingham, Orange
G.R. Kindley P.O. Box 280 Rockingham, N.C. 28380 Montgomery, Richmond, (910) 997-3153 (B) (910) 895-6102 (R) Fax (910) 895-1146	Division 8 Chatham, Lee, Moore, Randolph, Hoke, Montgomery, Richmond, Scotland

Dalton D. Ruffin
2871 Galsworthy Drive
Winston-Salem, N.C. 27106
(910) 722-2083 (B)
(910) 722-2336 (R)
Fax (910) 722-9520

Division 9

Davidson, Forsyth, Stokes, Rowan, Davie

Margaret Kluttz
P.O. Box 479
Salisbury, N.C. 28145
(704) 638-5231 (B)
(704) 633-8896 (R)
Fax (704) 638-5232

At-Large

Davie, Rowan

Carroll Edwards
P.O. Box 219
Marshville, N.C. 28103-0219
(704) 624-5098 (B)
Fax (704) 624-6812

Division 10

Anson, Stanly, Union, Cabarrus, Mecklenburg

Frank E. Emory, Jr.
1900 Independence Center
Charlotte, N.C. 28246
(704) 377-2536 (B)
(704) 596-6763 (R)
Fax (704) 378-4000

At-Large

(Assist with Mecklenburg)

Peter A. Pappas
The Harris Group
4201 Congress Street- Suite 175
Charlotte, N.C. 28209
(704) 556-1717 (B)
Fax (704) 552-9944

At-Large

Mecklenburg

Sam Erby, Jr.
P.O. Box 230
Granite Falls, N.C. 28630
(704) 396-3364 (B)
(704) 396-5980 (R)
Fax (704) 396-5986

Division 11

Alleghany, Ashe, Avery, Caldwell, Surry, Watauga, Wilkes, Yadkin

Ann H. Gaither
821 Woodson Road
Newton, N.C. 28658
(704) 735-3003 (B)
(704) 464-0362 (R)
Fax (704) 466-0363

Division 12

Alexander, Catawba, Cleveland, Gaston, Iredell, Lincoln

Gordon Myers
2140 Emmas Grove Road
Fairview, N.C. 28730
(704) 669-2941 (B)
(704) 628-3186 (R)
Fax (704) 452-3411

Division 13

Buncombe, Burke, Madison, McDowell, Mitchell, Rutherford, Yancey

Ron Leatherwood
P.O. Box 826
Waynesville, N.C. 28786
(704) 452-4500 (B)
(704) 452-5470 (R)

Division 14

Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Polk, Swain, Transylvania

Ex-Officio Member & Chairman

Garland B. Garrett, Jr.
North Carolina Department of Transportation
P.O. Box 25201
Raleigh, N.C. 27611
(919) 733-2520
Fax (919) 733-9150

DIVISION OF HIGHWAYS

DIVISION	DIVISION ENGINEER	TELEPHONE
1	D.R. Connor, P.E. P.O. Box 748 Ahoskie, N.C. 27910	(919) 332-4021
2	C.E. Lassiter, P.E. P.O. Box 1587 Greenville, N.C. 27835	(919) 830-3490
3	D.J. Bowers, P.E. 124 Division Drive Wilmington, N.C. 28401	(910) 251-5724
4	D.R. Dupree P.O. Box 3165 Wilson, N.C. 27893	(919) 237-6164
5	D.A. Allsbrook, Jr. P.O. Box 15580 Durham, N.C. 27704	(919) 560-6851
6	W.S. Vamedoe, P.E. P.O. Box 1150 Fayetteville, N.C. 28302	(910) 486-1493
7	J.W. Watkins, P.E. P.O. Box 14996 Greensboro, N.C. 27415-4996	(910) 334-3192
8	F.E. Whitesell, P.E. P.O. Box 1067 Aberdeen, N.C. 28315	(910) 944-2344
9	D.B. Waters 2125 Cloverdale Avenue Winston-Salem, N.C. 27103	(910) 761-2200
10	B.G. Payne, P.E. 716 West Main Street Albemarle, N.C. 28001	(704) 982-0101

11	W.E. Hoke, P.E. P.O. Box 250 North Wilkesboro, N.C. 28659	(910) 667-9111
12	R.W. Spangler P.O. Box 47 Shelby, N.C. 28150	(704) 480-5400
13	W.D. Smart, P.E. P.O. Box 3279 Asheville, N.C. 28802	(704) 251-6171
14	F.D. Martin, P.E. P.O. Box 37 Sylvia, N.C. 28779	(704) 586-2141

DIVISION OF HIGHWAYS

DIVISION	DISTRICT OFFICES	TELEPHONE
1	**District 1-** J.D. Jennings P.O. Box 1405 Elizabeth City, N.C. 27909 Counties- Camden, Currituck, Dare, Gates, Pasquotank, Perquimans	(919) 331-4737
	District 2- R.D. Smith P.O. Box 748 Ahoskie, N.C. 27910 Counties- Bertie, Hertford, Northampton	(919) 332-5372
	District 3- B.R. Leggett P.O. Box 928 Plymouth, N.C. 27962 Counties- Chowan, Hyde, Martin, Tyrrell Washington	(919) 793-4568
2	**District 1-** W.B. Benton 1701 West 5th Street Washington, N.C. 27889 Counties- Beaufort, Pitt	(919) 946-3689
	District 2- A.C. Everett 601 South Glenburnie Road New Bern, N.C. 28560 Counties- Carteret, Craven, Pamlico	(919) 514-4716
	District 3- R.E. Davenport 1620 Richlands Road Kinston, N.C. 28501 Counties- Greene, Jones, Lenoir	(919) 527-0053
3	**District 1-** D.R. Huffman 410 New Bridge Street Suite 7-A Jacksonville, N.C. 28540 Counties- Onslow, Pender	(910) 346-2040

District 2- J.B. Edwards (910) 592-6174
220 North Boulevard
Clinton, N.C. 28328
Counties- Duplin, Sampson

District 3- D.L. Thomas (910) 251-2655
300 Division Drive
Wilmington, N.C. 28401
Counties- Brunswick, New Hanover

4

District 1- B.A. Mills (919) 583-5861
P.O. Box 98
Halifax, N.C. 27839
Counties- Edgecombe, Halifax

District 2- L.R. Ward, P.E. (919) 459-2128
Route 2 Box 29C
Nashville, N.C. 27856
Counties- Nash, Wilson

District 3- S.S. Sanderson (919) 731-7938
4218 US 70 West
Goldsboro, N.C. 27530
Counties- Johnston, Wayne

5

District 1- T.L. Johnson (919) 733-2814
P.O. Box 33185
Raleigh, N.C. 27607
Counties- Wake

District 2- K.M. McIntire (919) 560-6854
P.O. Box 15580
Durham, N.C. 27704
Counties- Durham, Granville, Person

District 3- Bruce Jacobs (919) 492-0111
P.O. Box 205
Henderson, N.C. 27536
Counties- Franklin, Vance, Warren

6

District 1- R.J. Nelson, P.E. (910) 618-5546
P.O. Box 2157
Lumberton, N.C. 28359
Counties- Robeson

District 2- J.G. Nance, P.E. (910) 486-1496
P.O. Box 1150
Fayetteville, N.C. 28302
Counties- Cumberland, Harnett

District 3- R.E. Crumpler, P.E. (910) 642-3760
P.O. Box 27
Whiteville, N.C. 28472
Counties- Columbus, Bladen

7

District 1- T.J. Dyer (910) 570-6833
P.O. Box 766
Graham, N.C. 27253-0766
Counties- Alamance, Orange

District 2- S.L. Hall (910) 334-3161
P.O. Box 14996
Greensboro, N.C. 27415-4996
Counties- Guilford

District 3- S.P. Ivey (910) 634-5644
P.O. Box 2513
Reidsville, N.C. 27323
Counties- Caswell, Rockingham

8

District 1- J.L. Picklesimer, P.E. (910) 629-1423
P.O. Box 1164
Asheboro, N.C. 27203
Counties- Chatham, Randolph

District 2- J.A. Clendenin (910) 944-7621
P.O. Box 1067
Aberdeen, N.C. 28315
Counties- Lee, Hoke, Moore

District 3- W.T. Campbell, P.E. (910) 997-9210
P.O. Box 563
Rockingham, N.C. 28379
Counties- Montgomery, Richmond, Scotland

9

District 1- D.L. Honeycutt (704) 639-7560
4770 South Main Street
Salisbury, N.C. 28147
Counties- Davidson, Rowan

District 2- Landis Satterwhite (910) 761-2410
2125 Cloverdale Avenue
Winston-Salem, N.C. 27103
Counties- Davie, Forsyth, Stokes

10

District 1- J.A. Hough (704) 982-0104
716 W. Main St.
Albemarle, N.C. 28001
Counties- Stanly, Cabarrus

District 2- D.W. Spence, P.E. (704) 596-6900
P.O. Box 190
Newell, N.C. 28126
Counties- Mecklenburg

District 3- P.L. Moxley, P.E. (704) 289-1397
130 Sutherland Ave.
Monroe, N.C. 28110
Counties- Anson, Union

11

District 1- W.O. Atkins, P.E. (910) 835-4241
P.O. Box 558
Elkin, N.C. 28621
Counties- Alleghany, Surry, Yadkin

District 2- Roger Cates, P.E. (704) 265-5380
P.O. Box 1460
Boone, N.C. 28607
Counties- Caldwell, Avery, Watauga

District 3- D.J. Tetzlaff (910) 667-9117
P.O. Box 250
North Wilkesboro, N.C. 28659
Counties- Wilkes, Ashe

12

District 1- C.S. Ledbetter (704) 480-5402
P.O. Box 47
Shelby, N.C. 28151-0047
Counties- Cleveland, Gaston, Lincoln

District 2- J.W. Rand (704) 876-3947
P.O. Box 1107
Statesville, N.C. 28687
Counties- Alexander, Catawba, Iredell

13

District 1- S.A. Moore, P.E. (704) 652-3344
Route 1, Box 169C
Marion, N.C. 28752
Counties- Burke, McDowell, Rutherford
Mitchell

District 2- K.A. Wilson (704) 298-2741
P.O. Box 3279
Asheville, N.C. 28802
Counties- Buncombe, Madison, Yancey

14

District 1- J.J. Swain, Jr. P.E. (704) 891-7911
P.O. Box 5189
Horse Shoe, N.C. 28742
Counties- Transylvania, Henderson, Polk

District 2- C.R. Style (704) 488-2131
P.O. Box 250
Bryson City, N.C. 28713
Counties- Haywood, Jackson, Swain

District 3- J.B. Setzer (704) 321-4105
P.O. Box 1551
Andrews, N.C. 28901
Counties- Cherokee, Clay, Graham, Macon

APPLICATION REQUIREMENTS

Any person or corporation desiring to construct a new subdivision road which is to be dedicated as public, must submit the following information to the District Engineer for proper evaluation in order to obtain a certificate of approval as required by North Carolina General Statute 136-102.6.

If the new subdivision road (to be dedicated as public or private) will connect to a state system road, a permit authorizing construction on State right of way must be obtained from the Division of Highways before beginning any construction. Applications should be made to the District Engineer having jurisdiction in the area.

The appropriate District Engineer's Office can be determined from the listing beginning on Page Six (6) of this manual.

1. Two complete site layouts, including any future expansion anticipated.

2. Horizontal alignment indicating general curve data on site layout plan.

3. Vertical alignment indicated by percent grade, P. I. station, and vertical curve length on site layout plan. The District Engineer may require the plotting of the ground profile for roads where special conditions or problems exist.

4. Typical section indicating the pavement design and width, and the slopes, widths and details for either the curb and gutter or the shoulder and ditch proposed.

5. Routine drainage facilities and drainage areas can be reviewed by the District Engineer. For drainage facilities that cannot be handled by the District Engineer, assistance from the Hydraulics Unit in Raleigh will be required.

6. **Vicinity Map**

7. The number of platted lots on each road will be reviewed to insure that the minimum housing requirements in this manual are served.

8. Four copies of the Recorded Plat are to be furnished to the District Engineer after certification or upon application for State Maintenance.

SUBDIVISION ROADS

A subdivision road is one that serves a parcel or tract of land that is subdivided into two or more lots, building sites or other divisions for sale or building development for residential purposes where such subdivisions include a new road or change in an existing road.

Subdivision roads may be designated public or private. Public designations will be built to minimum construction standards of the North Carolina Department of Transportation as required under North Carolina General Statute 136-102.6. Private roads need not meet minimum construction requirements, but must meet minimum construction requirements before ever becoming a part of the State-maintained System.

Definitions

The following definitions shall apply in this manual:

1. Local residental subdivision road - Either cul-de-sacs, loop roads, roads that do not connect thoroughfares or serve major traffic generators.

   A. Cul-De-Sacs - These are very short roads, open at one end only, with a special provision for turning around. They have a "bulb" end design with a specific turning radii and a limited number of lots.

   B. Dead End Roads - These are roads less than 2,500 feet in length, open at one end only without special provisions for turning around and have no collector characteristics.

   C. Short Connecting Roads - These roads are normally one block long or extend on a block-by-block basis and have no collector characteristics.

   D. Loop Roads - A road that has its beginning and ending points on the same route. It is less than one mile in length and has no collector characteristics.

   E. Other Roads - These roads do not connect thoroughfares or serve major traffic generators and do not have "collector" characteristics.

2. Residential collector roads - A road which serves as the connecting street between local residential roads and the thoroughfare system.

   A. Dead End Roads - These roads are more than 2500 feet in length, open at one end only without special provisions for turning around, and have collector characteristics.

   B. Connecting Roads - The roads which serve as the connecting road system between other roads within the subdivision and the thoroughfare system.

   C. Loop Roads - A road that has its beginning and ending points on the same route. It is more than one mile in length and has collector characteristics.

D. Other Roads - These are other roads having a "collector" type function in the thoroughfare system.

Requirements for Addition of Subdivision Roads to the System:

1. The minimum construction standards and other requirements in this manual must be a part of the proposal to be reviewed for approval in order for a plat to be recorded by the County Register of Deeds prior to development.

2. A Petition for Addition (DOT Form SR 1) is required from the developer and/or property owners.

3. Developers or property owners must dedicate right of way, as indicated in the minimum design and construction criteria section of this manual, free of charge and clear of all encumbrances.

4. Utilities requiring adjustment or relocation to conform to Division of Highways' requirements (See Utility Requirement) shall be made at no expense to the Division of Highways. Existing and/or relocated utilities may remain within the right of way of any subdivision road added to the Secondary Road System provided the location of same meets Division of Highways' approval and further provided the utility owner executes an encroachment agreement on forms furnished by the Division of Highways. As per General Statute 136-102.6, "Utilities are defined as electric power, telephone, television, telegraph, water, sewage, gas, oil, petroleum products, steam, chemicals, drainage, irrigation and similar lines". G. S. 136-102.6 dictates further that "The right of any utility placed or located on a proposed or existing subdivision public road right of way shall be subordinate to the road right of way, and the utility shall be subject to regulation by the Board of Transportation".

5. At least 20 percent of the lots bordering the road must be individually owned.

6. There must be at least two occupied residences for each one-tenth of a mile. Subdivision Access Roads must provide ingress and egress for at least 5 occupied residences for roads less than 1 mile in length and an average of 5 occupied residences per mile for roads over 1 mile in length.

   Subdivision Access Road - This is a road built through vacant property to provide access to the property being developed. This road would not have lots platted along it.

7. A minimum of four occupied homes is required for the addition of roads less than two-tenths of a mile in length. Short cul-de-sacs less than two-tenths mile in length must serve at least four occupied homes. If four occupied homes are not served, it will be treated as a private drive.

8. Connecting roads with less than the required occupied homes for the length involved may be reviewed as to traffic usage for addition purposes. Traffic usage equivalent to the traffic that would be generated by the correct number of occupied homes will be acceptable.

9. Any subdivison road with a right of way dedicated, recorded, or that has preliminary approval from a county planning board dated after September 30, 1975, will not be added to the State System unless the road is paved to the minimum construction standards of the Division of Highways for subdivision roads.

10. The Division of Highways will consider the addition of roads that serve developments with large lots or parcels that are of the size that the occupied housing requirement of two homes per tenth of a mile cannot be met. The number of occupied homes needed will be a judgment factor based upon the length and the number of lots or parcels involved. The minimum requirement will be four occupied homes.

11. Erosion and Sedimentation - All subdivision roads shall have an acceptable permanent vegetative cover established and other acceptable permanent erosion control measures installed in accordance with Division of Highways' specifications, prior to addition to the State Maintained System.

12. Subdivision roads shall meet the minimum design and construction criteria contained herein prior to addition to the State System and shall be in an acceptable state of maintenance when petitioned for State Maintenance.

13. All pipe culverts, storm sewers and appurtenances shall be free of all debris and silt build-up and shall be structurally and hydraulically sound, and functioning in a normal manner. All drainage ditches shall be of such a width and depth and with such a slope as to carry the anticipated discharges. Paved ditches or Rip Rap shall be required where necessary.

14. Where extenuating circumstances exist, the Division Engineer has the authority to allow deviations from the design and construction criteria presented in this manual. The deviations allowed will be reasonable and limited only by safety and maintenance factors. No deviation will be allowed from the typical section requirements except by written approval from the Secondary Roads Officer.

15. Within a Municipal Extra Territorial Jurisdiction or within Counties having local ordinances affecting subdivisions, the more restrictive ordinance shall apply.

16. For the Policy on Roadway Bridges and Dams, see Page 16.

UTILITY REQUIREMENTS

1. LOCATION

Poles and other above-ground utilities which are to remain inside the right of way under encroachment agreement shall be located at or as near as practical to the right of way line. As a minimum above-ground utilities shall be located outside the clear roadside area for the highway section involved.

Where there are curbed sections, above-ground utilities should be located as far as practical behind sidewalks. There is no single minimum dimension for setback of poles, fire hydrants, etc., behind curbs; however, where there are curbed sections and no sidewalks, 6' will be used as a design safety concept guide.

2. Depth of Cover for Pipe Lines and Other Utilities

a. Longitudinal pipe lines and electric power primary ..... 3'
b. Longitudinal electric power secondary, and trenched communication lines ..... 2'
c. Crossings under roadways ..... 3'
d. Crossings under ditches ..... 2'
e. Plowed-in communication lines ..... 18"

3. For residential subdivision roads and residential collector roads, underground utilities may cross under or run longitudinally under the pavement. For all other roads and highways, underground utilities may cross under but <u>not</u> run longitudinally under the pavement except in unusual situations approved by the Division Engineer.

4. Acceptable Materials for Utilities Under Existing or Proposed Pavement - Materials Not Listed Will Be Referred to the Design Services Unit - Roadway Utilities Section.

a. Smooth Wall Steel Pipe meeting API 5L Grade B Specifications
b. Spiral Welded Steel Pipe meeting ASTM Specification A-211
c. Circular Black Steel Pipe meeting ASTM Specification A-120 or A-589
d. Galvanized Steel Pipe meeting ASTM A-120 Specifications
e. Ductile Iron Pipe - Class 50 Min. Strength
f. Cast Iron Pipe - Class 150 Min. Strength
g. Concrete Sewer Pipe - Plain and Reinforced Pipe meeting Department of Transportation Standard with Rubber Gasket Joints
h. Reinforced Concrete Pressure Pipe, Steel Cylinder Type for Water and other Liquids meeting AWWA Specifications C-300, C-301 and C-303
i. ABS (Acrylonitrile - Butadiene - Styrene) Composite Sewer Pipe shall meet ASTM D-2680 Specifciations for Pipe sizes 8" thru 15", and ASTM D-2751 for Pipe sizes 4" and 6" for Laterals. ABS Sewer Pipe shall be used for Domestic Sewage only.
j. P.V.C. (Polyvinyl Chloride) Pipe - SDR 21, SDR 26 or C-900 for Water and SDR 35 for Sewer only.

k. V.C. (Vitrified Clay) Sewer Pipe, Extra Strength meeting ASTM Specifications C-700 with Factory Fabricated Joints meeting ASTM Specifications C-425

l. P.E. (Polyethylene) Plastic Pipe - SDR 7 meeting ASTM Specifications D-2239 and Plastic Tubing - SDR 9 meeting ASTM Specificaton D-2737 for sizes 3/4" thru 2" only.

m. Polyethelyene Plastic Pipe (High Molecular Weight) SDR 11 meeting Plastic Pipe Institute Material Designation PE 3408 in sizes up to 4.5" O.D.

n. Type K Copper Pipe meeting ASTM Specification B-88 for sizes 3/4" thru 2"

5. Acceptable materials for utilities outside pavement shall be the same as covered in Paragraph 4 above; however, minimum strength of pipe may be reduced in accordance with applicable industry codes.

6. Any utility to be installed within the right of way of a state maintained road will require an encroachment agreement with the North Carolina Board of Transportation in accordance with their publication entitled Policies and Procedures for Accommodating Utilities on Highway Rights of Way.

MINIMUM DESIGN AND CONSTRUCTION CRITERIA FOR SUBDIVISION ROADS

I. CONSTRUCTION REQUIREMENTS

A. DRAINAGE

The Division of Highways shall review all drainage prior to acceptance of any facility to the State System.

All storm drainage shall be adequate so that the road may be maintained without excessive cost, and not cause flooding on private property from storm runoff of the design frequency. Permanent drainage easements may be required. The minimum design frequency shall be as follows but may be increased at the recommendation of the Hydraulics Unit Head.

1. Storm sewer collector - 10 years
2. Cross drainage - 25 years

In areas where ditch grades or quantities of flow deem it impracticable to establish and maintain vegetation, an erosive resistant lining such as paving or rock rip rap may be required.

Subsurface drainage shall be adequate to maintain a stable subgrade.

When road crossings are within areas designated as flood hazard areas under the Federal Flood Insurance Program, the design must be approved by the responsible local governing agency for its consistency with local flood zoning ordinances.

B. BRIDGES AND DAMS

Bridges

Minimum criteria for bridges to be built by private interest for future acceptance by the Division of Highways.

1. Structures which are to span streams shall be designed for hydraulic requirements in accordance with Division of Highways criteria, and plans shall be submitted to the Hydraulics Unit for review and approval.

   Rip Rap will be required as recommended by the Hydraulics Unit.

2. Structures shall be designed for minimum live load of HS-20 as specified in the Standard Specifications for Highway Bridges of the American Association of State Highway Officials, and plans shall be submitted for review and approval by the Structure Design Unit

3. Bridge deck width shall match the roadway approach widths when curb and gutter approaches are provided (26' minimum) and the face of the bridge rail shall be placed in line with the face of the curb for speed limits less than 45 M.P.H. For speed limits of 45 M.P.H. or greater the face of the bridge rail shall be offset 4 feet from the edge of pavement. Curb and gutter will be transitioned out in 50 feet to line up the face of curb and bridge rail. For shoulder section roadways, the bridge width should be a minimum of 24'.

4. The following materials are acceptable for bridge construction:

   a. For substructures - reinforced concrete, structural steel, structural creosoted timbers, prestressed concrete, creosoted timbers or steel piles or combination of these materials.

   b. For superstructures - prestressed concrete, structural steel I-beams with reinforced concrete deck or corrugated metal deck with asphaltic wearing surface, treated timber stringers with reinforced concrete deck.

   c. The type and design of bridge rails shall be as approved by the Structure Design Unit of the Division of Highways.

5. All material and workmanship used in construction of the structure shall be in accordance with North Carolina Division of Highways Specifications.

Roadway Dams

1. It is the policy of the Divison of Highways to discourage the location of roadways on dams. In those cases, where a definite advantage may be gained or a substantial savings in funds may be realized, the utilization of a dam for a roadway may be favorably considered.

2. Where it is determined that a dam will be utilized as a roadway, the following criteria must be met:

   A. When applicable, the dam must have certification from the N. C. Department of Natural Resources and Community Development pursuant to the "Dam Safety Law of 1967", (As amended by the General Assembly of 1977).

   B. All pertinent data regarding the design of the embankment as an impoundment structure must be presented to the Division of Highways for review.

   C. The top cross section dimension must be the roadway width required (from shoulder point to shoulder point) for the facility plus a minimum of 4'.

D. Guardrail will be provided on the impoundment side of the roadway. For safety the District Engineer may require guardrail on both sides of the roadway.

E. Spillway will be designed to provide 2' of freeboard at the shoulder for an estimated 50-year design frequency outflow as a minimum.

F. A means of draining the lake completely will be provided.

3. Design acceptance or approval by the Division of Highways is limited to the use of the dam as a roadway and is in no way intended as approval of the embankment as an impoundment structure.

4. Responsibility incurred by the Division of Highways when a section of roadway crossing a dam is accepted as a part of the state maintenance system is limited to maintenance of the roadway for highway purposes from shoulder point to shoulder point only. Responsibility for the impoundment, any damage that may result therefrom, and maintenance of the dam or appurtenances as may be required to preserve it's integrity as a water impoundment structure, shall remain with the owner of the impoundment. Any such maintenance work will be subject to the provisions of G.S. 136-93.

5. Impoundment of water on highway right of way may be allowed under the following criteria:

A. The impoundment does not adversely affect the right of way for highway purpose.

B. Adjustment, as required, flattening slopes, installing rip rap, and any others, shall be the responsibility of the developer.

6. Structures should be designed and plans prepared under the supervision of a Registered Professional Engineer.

C. CURB AND GUTTER

All curb and gutter sections must meet Division of Highways standards.

1. The standard 2'-6" concrete curb and gutter is the preferred type to be used. Types of other curb may be used provided the 6" height is maintained.

2. The concrete Valley Gutter is an allowable type.

3. Any other types of gutter will be subject to the approval of the Division Engineer after review on an individual basis. Approval will be subject to the terrain factors in the area under study as they relate to potential maintenance problems.

D. WHEEL CHAIR RAMPS

In accordance with General Statute 136-44.14, all street curbs in North Carolina being constructed or reconstructed for maintenance procedures, traffic operation, repairs, correction of utilities or altered for any reason after September 1, 1973, shall provide wheel chair ramps for the physically handicapped at all intersections where curb and gutter is provided and at other major points of pedestrian flow.

Wheel chair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways' publication entitled, Guidelines, Curb Cuts and Ramps for Handicapped Persons.

E. PAVEMENT DESIGNS

Shown below are minimum thicknesses of base and surface course to be used. Design should be chosen from Group 1 or Group 2 depending on subgrade soil type.

GROUP I

Good to Excellent Subgrade Soil Types	Base Course	Pavement Surface
A-1-a, A-1-b, A-3 A-2-4, A-2-5, A-2-6, A-2-7	7" STBC, Type A or C	2" SA or I-2
	9" STBC, Type A or C	1 1/2" SA or I-2
	8" ABC or STBC, Type B	BST, 1" SA or I-2
	6" ABC or STBC, Type B	1 1/2" SA or I-2
	3" BCBC, Type HB	1 1/2" SA or I-2
	3 1/2" BCBC, Type HB	1" SA or I-2
		5" Plain Concrete

GROUP II

Poor to Fair Subgrade Soil Types		
A-4, A-5, A-6, A-7-5 A-7-6	9" STBC, Type A or C	2" SA or I-2
	8" ABC or STBC, Type B	1 1/2" SA or I-2
	10" ABC or STBC, Type B	BST, 1" SA or I-2
	4" BCBC, Type HB	1 1/2" SA or I-2
	3" BCBC, Type HB	2" SA or I-2
		6" Plain Concrete

Any other pavement design must be reviewed by the Division Engineer on an individual basis and approval will be based upon sound engineering principles.

NOTE:

Subgrade	No base course shall be placed on muck, pipe clay, organic matter or other unsuitable material. The District Engineer may require a subgrade soils test, if needed, to determine the soils classification type.
ABC	Aggregate Base Course, No. 7 stone.
STBC	Soil Type Base Course
BST	Bituminous Surface Treatment
SA	Bituminous Concrete Surface Course, Type F-1 (Sand Asphalt)
I-2	Bituminous Concrete Surface Course, Type I-2 NOTE: I-1 may be used in lieu of I-2
BCBC	Bituminous Concrete Base Course, Type HB (Black Base)

Other base courses such as various cement-treated materials may be used in lieu of those shown above. These materials shall be of sufficient thickness to provide equivalent strength. However, any design other than those shown above must also be approved prior to use by the Division Engineer.

All materials shall meet the requirements set forth in the latest edition of the North Carolina Standard Specifications for Roads and Structures.

F. MINIMUM DESIGN CRITERIA

1. Local Residential Subdivision Roads include:

a. Cul-De-Sacs
b. Dead End Roads - Less than 2500 feet in length
c. Short Connecting Roads - One block long or that extend on a block-by-block basis
d. Loop Roads - Less than one (1) mile in length
e. Other roads that do not connect thoroughfares or serve major traffic generators. These Roads do not have "collector" characteristics.

TERRAIN CLASSIFICATION	LEVEL	ROLLING	HILLY
Terrain Classification Definition Level - Cross slope range of 0% to 8% Rolling - Cross slope range of 8.1% to 15% Hilly - Cross slope over 15%			
Right of Way Width			
Curb and Gutter Section	40'	40'	40'
Shoulder Section	45'	45'	45'
Pavement Width			
Curb and Gutter Section	*26' G-G	*26' G-G	*26' G-G
Shoulder Section	18'	18'	18'
G-G refers to face to face of standard curb and gutter section, bottom of the "V" to bottom of the "V" for the Valley Types Section. Other types will be reviewed by the Division Engineer with the GG limits applicable			
Minimum Shoulder Width			
Shoulder Section	6'	4' to 6'	4' to 6'
Shoulder width between 4' to 6' shall be approved by the Division Engineer considering adjacent land characteristics			
Maximum Cut and Fill Slopes	2:1	2:1	1 1/2:1
Design Speed	30 mph	25 mph	20 mph
Minimum Sight Distance on Vertical Curves	200'	150'	110'
Minimum Centerline Radius	230'	150'	90'
Minimum Superelevation Rate for Minimum Radius	.06'/'	.04'/'	.02'/'
Maximum Grade	9%	12%	18%
Grades for 100' each way from intersection exceeding 5 percent (%) may be reviewed by Division Engineers for consideration. Grades less than 0.5 percent should not be used unless reviewed individually by the Division Engineer to determine potential maintenance problems.			
K = Rate of Vertical Curvature for Minimum Sight Distance	28	18	10
Formula for determination of length of vertical cruve required to provide minimum sight distance.			
[L = KA] L = Length of vertical curve in feet K = Rate of vertical curvature in feet per percent of A A = Algebraic difference in grades in percent			
Minimum Cul-De-Sac Radius Right of Way			
Curb and Gutter Section	45'	45'	45'
Shoulder Section	50'	50'	50'
Minimum Cul-De-Sac Radius			
Curb and Gutter Section	37' to G	37' to G	37' to G
Shoulder Section*	35'	35'	35'

2. Residential Collector Roads include:

* See Page 24

2. Residential Collector Roads include:

a. Dead End Roads - More than 2500 feet in length
b. Connecting roads between the local residential subdivision roads and the thoroughfare system
c. Loop Roads - More than one (1) mile in length
d. Other roads having a "collector" type function in the thoroughfare system

TERRAIN CLASSIFICATION	LEVEL	ROLLING	HILLY
Terrain Classification Definition Level - Cross slope range of 0% to 8% Rolling - Cross Slope range of 8.1% to 15% Hilly - Cross slope over 15%			
Right of Way Width			
Curb and Gutter Section	50'	50'	50'
Shoulder Section	50'	50'	50'
Pavement Width			
Curb and Gutter Section	34' G-G	34' G-G	34' G-G
Shoulder Section	20'	20'	20'
G-G refers to face to face of standard curb and gutter section, bottom of the "V" to bottom of the "V" for the Valley Type Section. Other types will be reviewed by the Division Engineer with the G-G limits applicable.			
Minimum Shoulder Width			
Shoulder Section	6'	6'	6'
Maximum Cut and Fill Slopes	2:1	2:1	1 1/2:1
Design Speed	35 mph	30 mph	25 mph
Minimum Sight Distance on Vertical Curves	250'	200'	150'
Minimum Centerline Radius	310'	230'	150'
Minimum Superelevation Rate for Minimum Radius	.08'/'	.06'/'	.04'/'
Maximum Grade Grades for 100' each way from intersection exceeding 5 percent (%) may be reviewed by Division Engineers for consideration. Grades less than 0.5 percent should not be used unless reviewed individually by the Division Engineer to determine potential maintenance problems.	6%	9%	12%
K = Rate of Vertical for minimum sight distance Formula for determination of length of vertical curve required to provide minimum sight distance.	45	28	18

[L = KA]
L = Length of vertical curve in feet
K = Rate of vertical curvature in feet per percent of A
A = Algebraic difference in grades in percent

3. Thoroughfare Plan Roads

For subdivision developments resulting in the construction of a thoroughfare plan route by the developer, the subdivision plan will be forwarded thru the District Engineer, to the Traffic Engineering Branch for review by appropriate personnel of the Division of Highways in Raleigh, North Carolina.

4. Industrial Access or Commercial Complex Roads

The minimum construction standards for industrial access road requests or for commercial centers and apartment complexes will be reviewed individually. The construction standards for pavement design will be in line with expected usage. Normally, you can expect roads of this type to have a pavement design of

1. 8" ABC - 2" BCBC Type H plus 2" BCSC Type I-2 or I-1
2. 8" ABC - 2" BCBC Type I-2 or I-1

G. ROAD INTERSECTIONS (See Figures 3 and 4).

1. The most desirable intersections are those with angles of 75 to 90 degrees. Intersections with angles from 60 to 75 degrees are acceptable under extreme conditions.

2. Minimum sight distance for stop condition when connecting new local residential roads or residential collector roads to existing state maintained roads is 70 feet along the existing road right of way and 10 feet along the new road right of way.

3. All internal intersections shall have a minimum 20' radii.

4. Unusual designs such as "Bubble Type" configurations to allow for more lots, will not be allowed.

H. ISLANDS OR SHORT MEDIANS AT SUBDIVISION ENTRANCES

The Division of Highways will review requests for the allowance of islands or short medians desired for aesthetics on State Highway System Secondary Roads at the entrance to a subdivision. The location will be outside the line of sight at the entrance intersection. Approval will be with the following understanding:

1. The Division of Highways will not maintain the island or the median section.

2. The island or the median secton will be removed if not properly maintained by someone involved with the subdivision, i.e. developer, homeowners, etc.

3. The Division Engineer may allow the island or median sections after review on an individual basis.

4. The minimum lane width at the entrances, excluding curb and gutter will be 14'.

I. SUBDIVISION NAME MARKERS

The Division of Highways will review requests to erect subdivision name markers on an individual basis. The name markers may be allowed to be located within the State Highway System Secondary Road rights of way at the beginning of a subdivision road provided the location of such is outside the line of sight and the normal maintenance limits. The name markers will be approved only at locations which will not sacrifice safety to the general traveling public. Approval to erect subdivision name markers will be with the following understanding:

1. All costs will be the responsibility of the requestor.

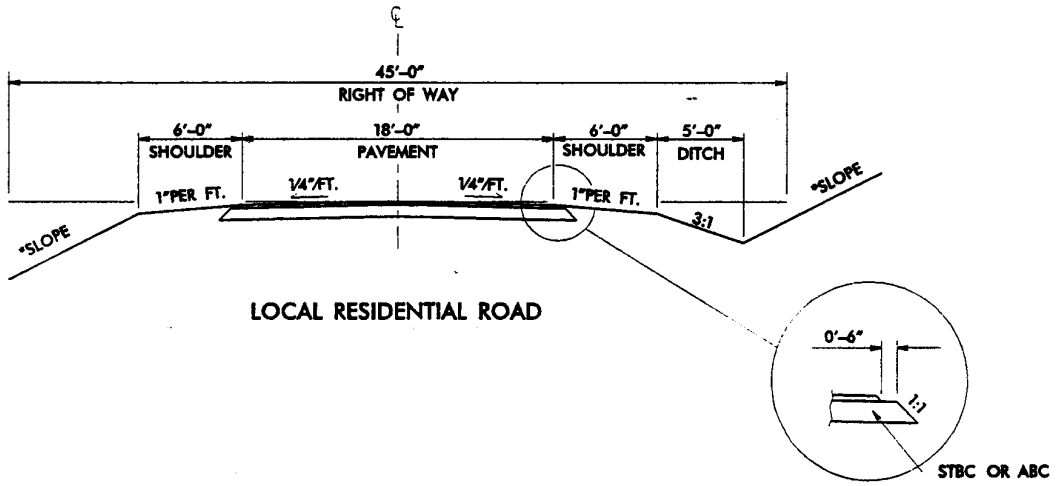
2. The Division of Highways will not maintain the marker or the area around th marker.

3. The markers will be removed if not properly maintained.

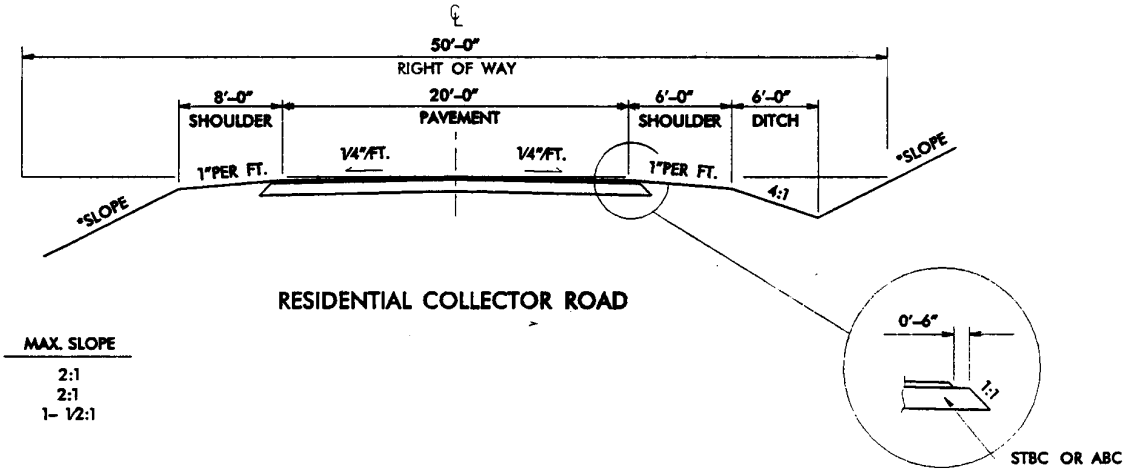
4. The Division Engineer may allow the subdivision name markers on secondary road rights of way after review on an individual basis.

* NOTE: On Minor Residential Subdivision Roads, a maximum of two-tenths of a mile in length, 22 feet back to back for valley-type curb and gutter with 18 feet of pavement will be allowed.

Cul-de-sac designs other than the "Bulb" End Design will be subject to the approval of the Division Engineer after review on an individual basis. See Page 32 for several examples of Minor Residential Cul-De-Sac Designs.

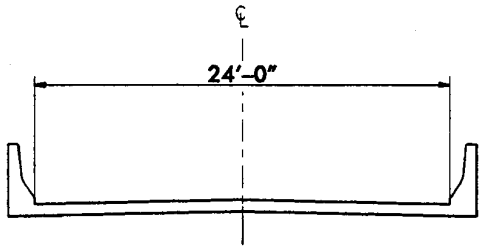


LOCAL RESIDENTIAL ROAD



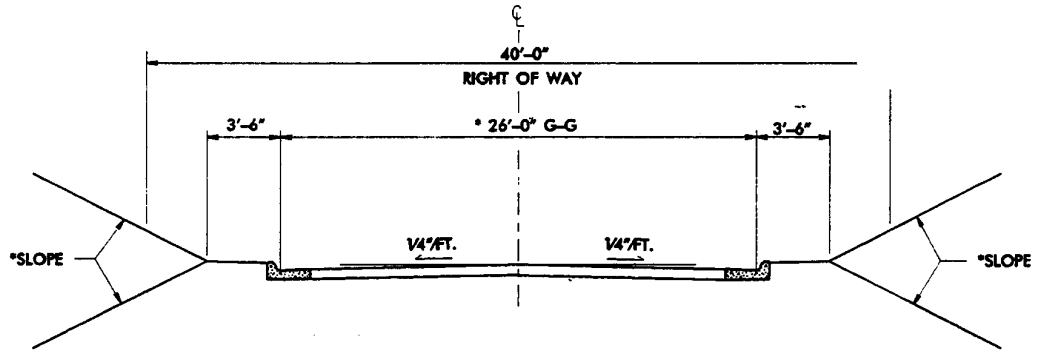
RESIDENTIAL COLLECTOR ROAD

* TERRAIN	MAX. SLOPE
LEVEL	2:1
ROLLING	2:1
HILLY	1- 1/2:1



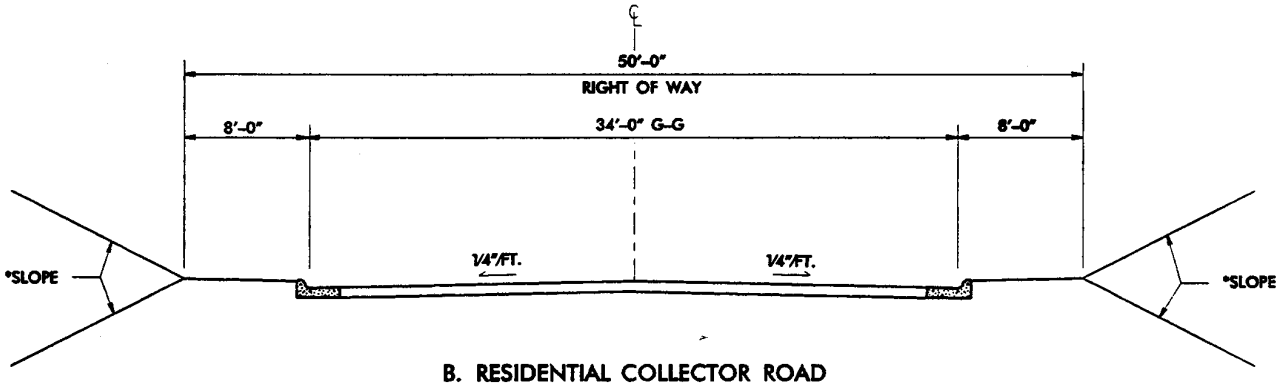
BRIDGE TYPICAL SECTION

FIGURE 1: CROSS-SECTION-SHOULDER SECTION



A. LOCAL RESIDENTIAL ROAD

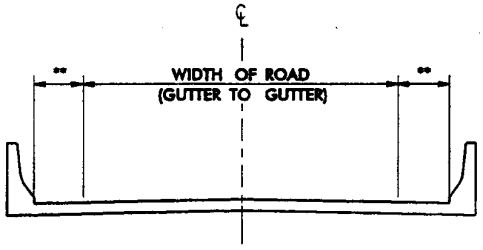
*NOTE:
ON MINOR RESIDENTIAL SUBDIVISION ROADS, A MAXIMUM OF TWO-TENTHS OF A MILE IN LENGTH, 24'-0" G-G MAY BE USED.



B. RESIDENTIAL COLLECTOR ROAD

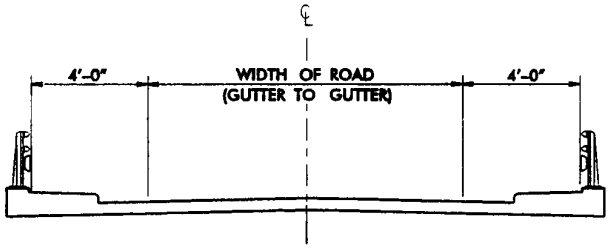
* TERRAIN	MAX SLOPE
LEVEL	2:1
ROLLING	2:1
HILLY	1-1/2:1

NOTE:
FOR BOTH 'A' & 'B', REQUEST FOR TYPICAL SECTIONS APPROVALS BY THE DEPARTMENT OF TRANSPORTATION THAT INCLUDES SIDEWALKS OR FUTURE SIDEWALKS WILL BE REVIEWED INDIVIDUALLY BY THE DIVISION ENGINEER



** SPEED LIMIT	OFFSET
< 45 MPH	0'
≥ 45 MPH	2'-0"

C. BRIDGE TYPICAL SECTION WITHOUT SIDEWALK



D. BRIDGE TYPICAL SECTION W/SIDEWALK

FIGURE 2: CROSS SECTION: CURB & GUTTER SECTION

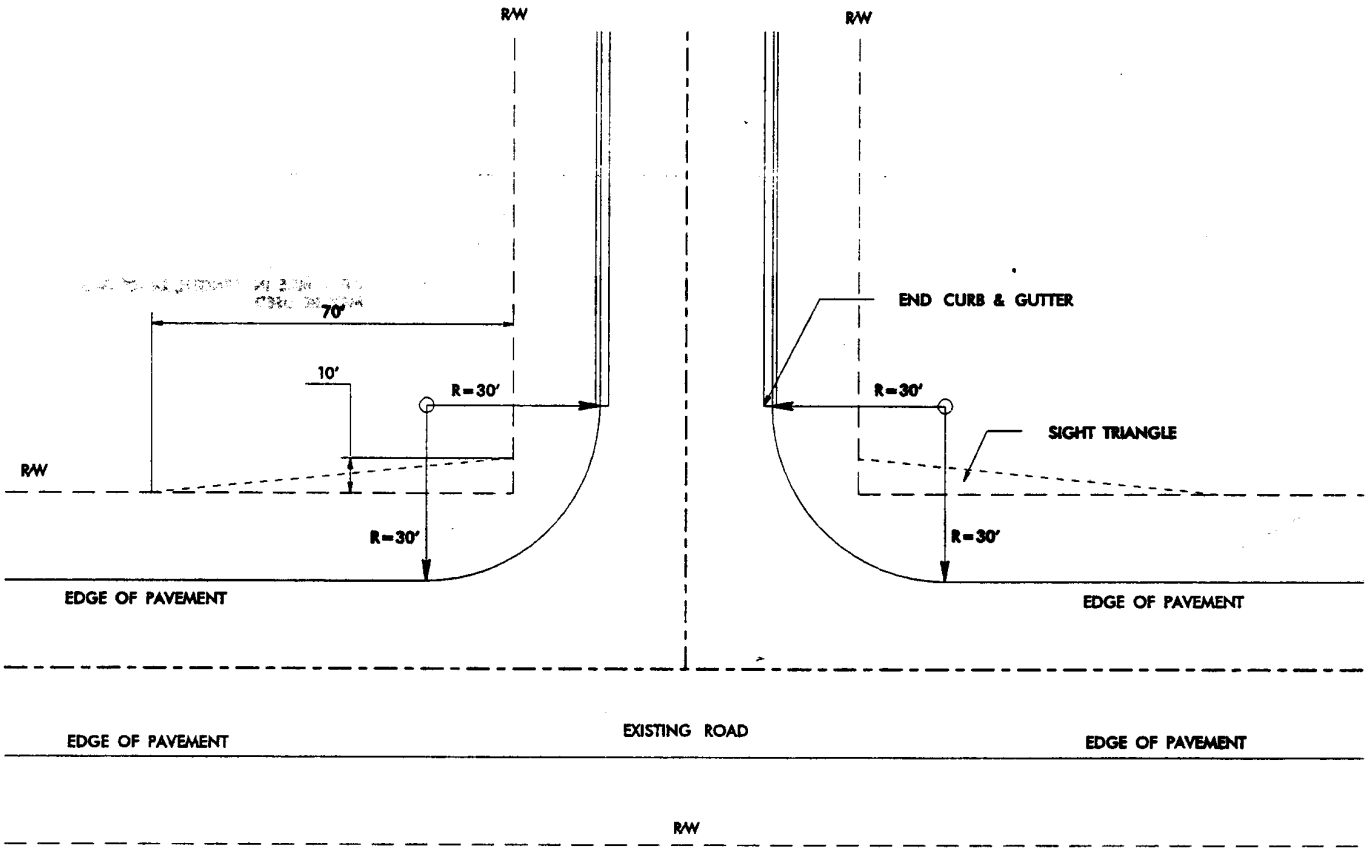


FIGURE 3

RECOMMENDED ROAD CONNECTION

NEW RESIDENTIAL ROAD OR RESIDENTIAL COLLECTOR ROAD WITH CURB & GUTTER AND EXISTING STATE MAINTAINED ROAD WITH SHOULDER SECTION

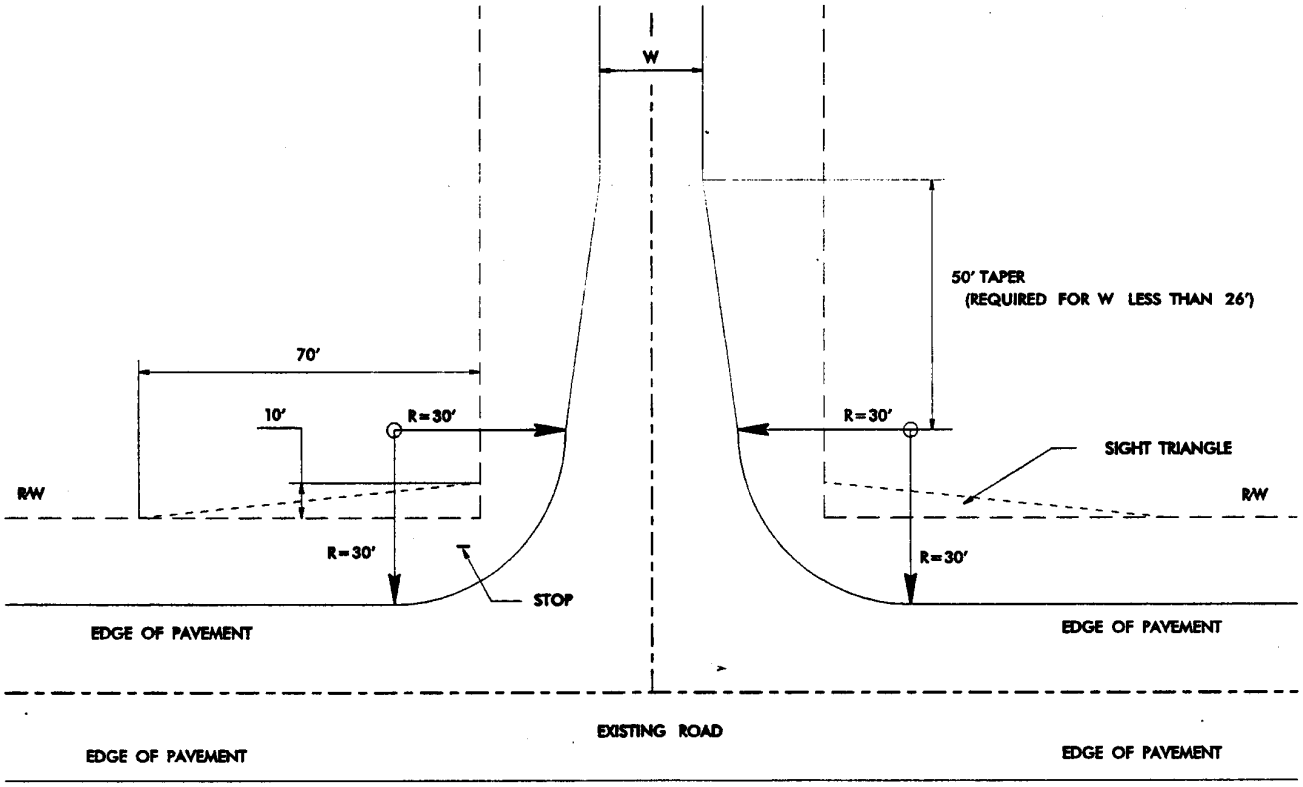
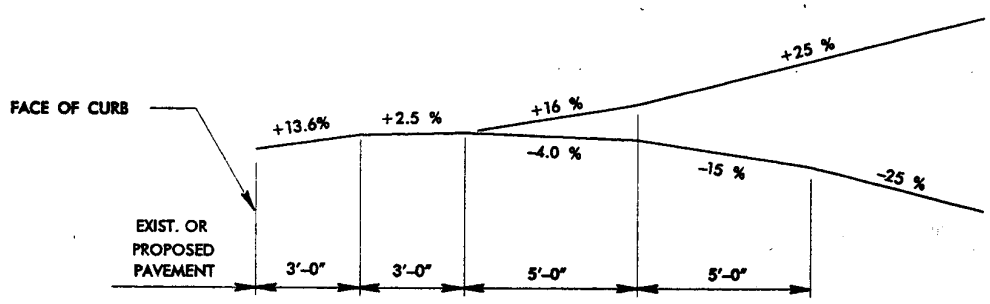


FIGURE 4

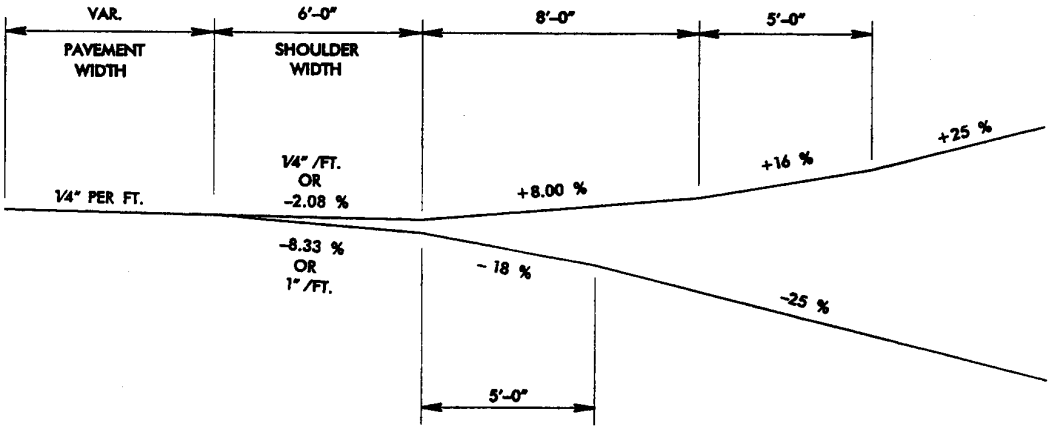
RECOMMENDED ROAD CONNECTION

NEW RESIDENTIAL ROAD OR RESIDENTIAL COLLECTOR ROAD AND EXISTING STATE MAINTAINED ROAD

STOP CONDITION



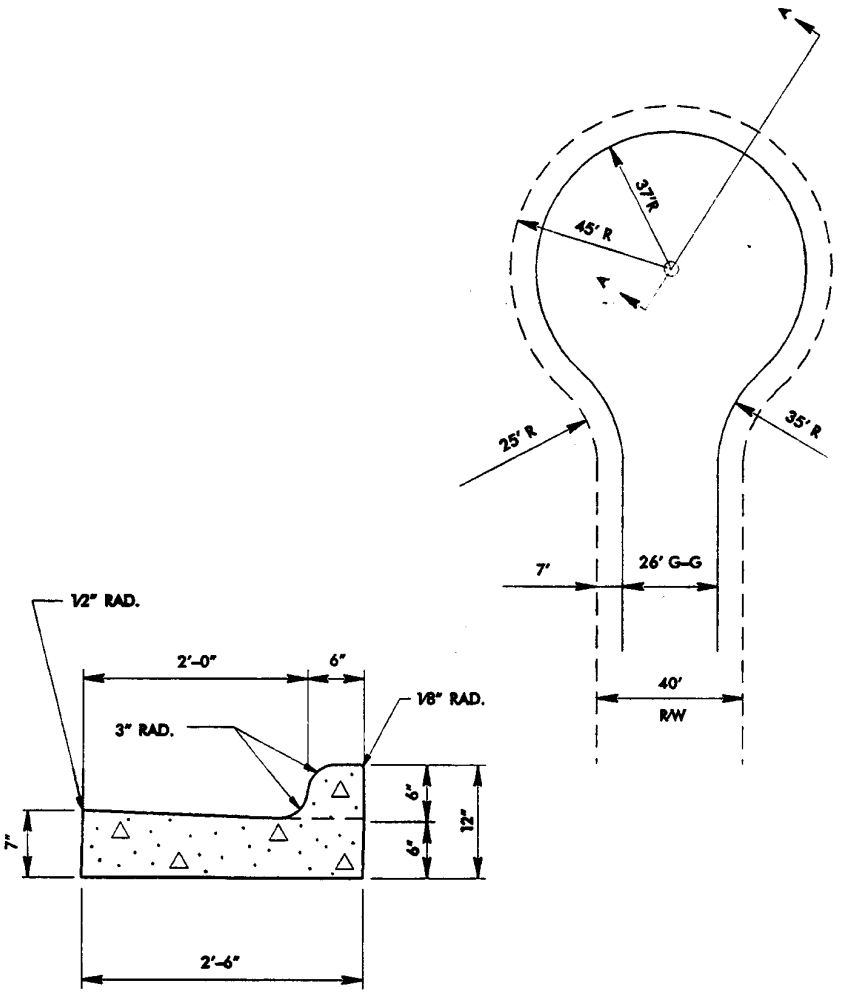
A. CURB & GUTTER SECTION



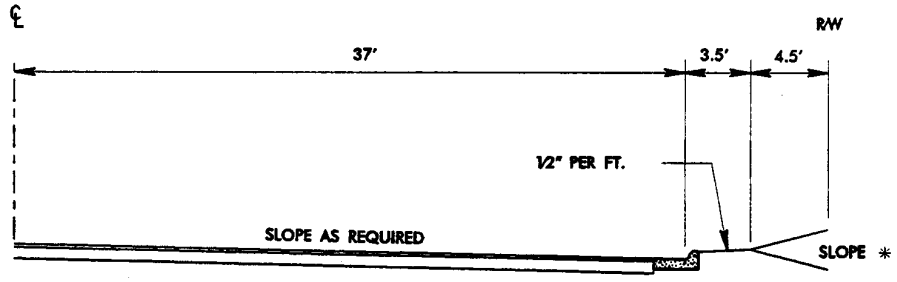
B. SHOULDER SECTION

FIGURE 5

DRIVEWAY TURNOUT GRADES



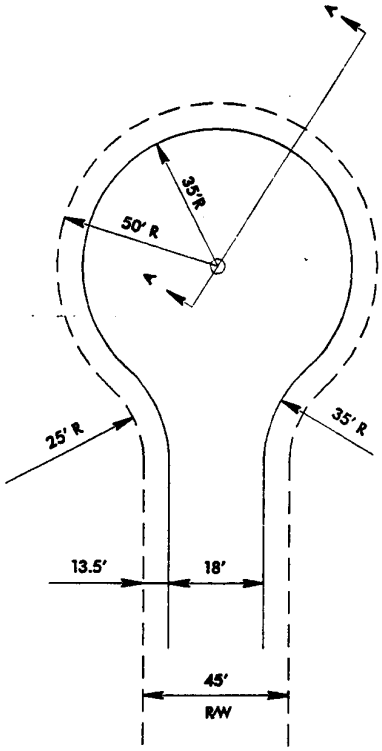
2'–6" CURB & GUTTER

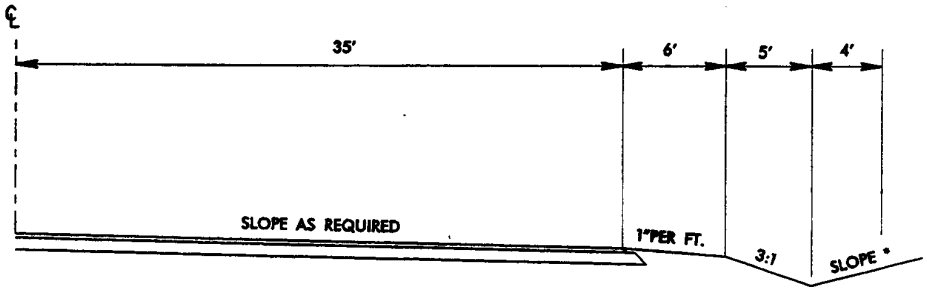


TERRAIN	MAX. SLOPE
LEVEL	2:1
ROLLING	2:1
HILLY	1–1/2:1

SECTION AA

FIGURE 6
SYMMETRICAL CUL-DE-SAC WITH
CURB & GUTTER





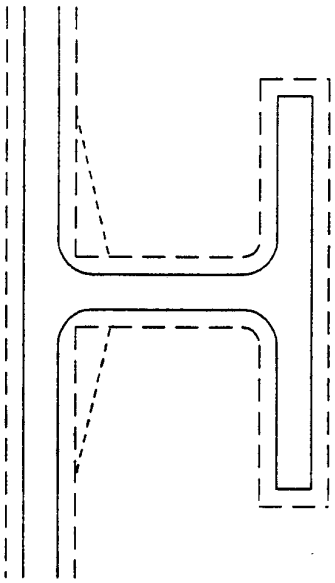
TERRAIN	MAX. SLOPE
LEVEL	2:1
ROLLING	2:1
HILLY	1-1/2:1

SECTION AA

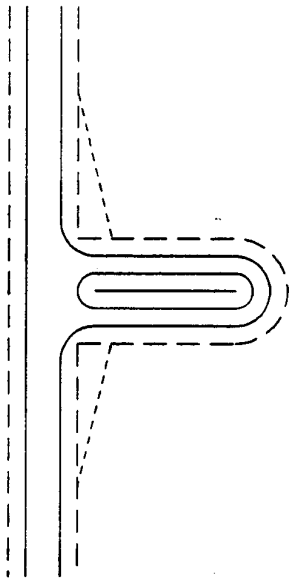
FIGURE 7

SYMMETRICAL CUL-DE-SAC NO

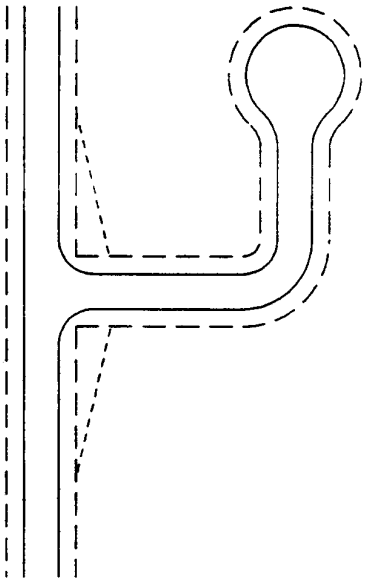
CURB & GUTTER



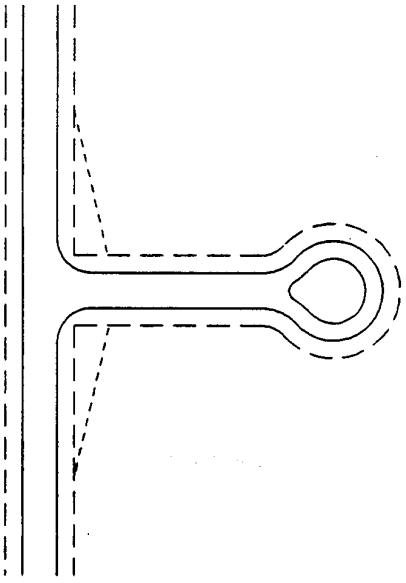
"T" CUL-DE-SAC



"LOOP" ROAD



"L" CUL-DE-SAC

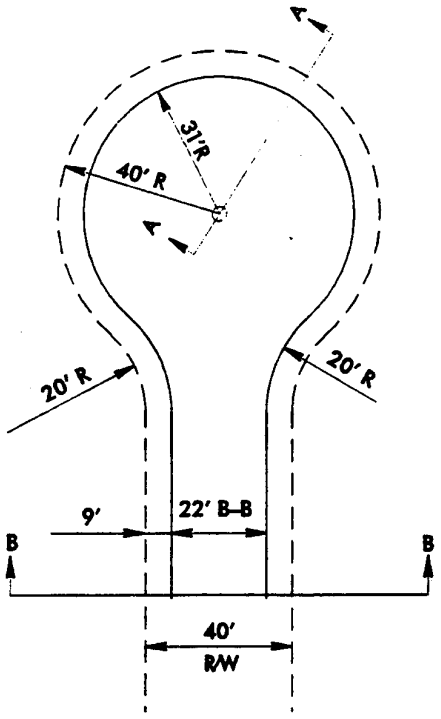


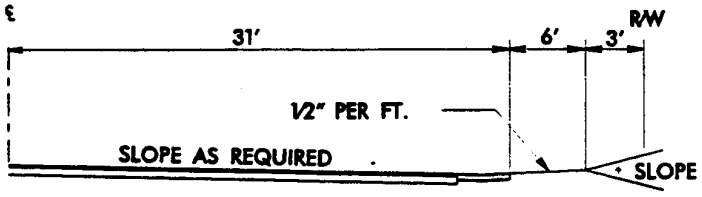
CUL-DE-SAC WITH INTERIOR ISLAND

FIGURE 8

EXAMPLES OF MINOR

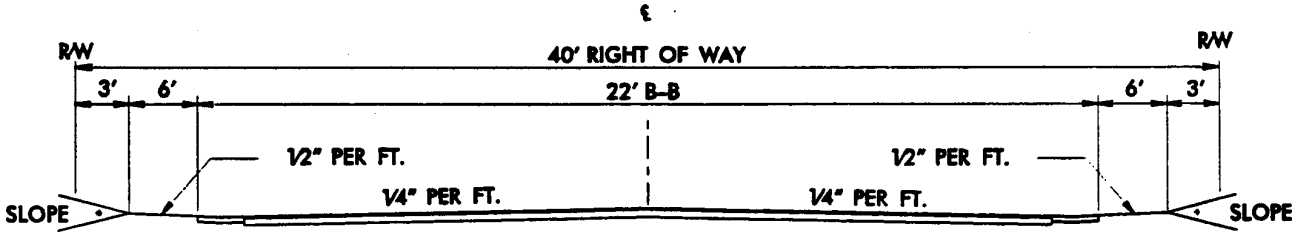
RESIDENTIAL CUL-DE-SAC DESIGNS





SECTION AA

TERRAIN	MAX. SLOPE
LEVEL	2:1
ROLLING	2:1
HILLY	1-1/2:1



SECTION BB

NOTE: THIS DESIGN IS TO LIMITED TO LOOP ROADS AND CUL-DE-SACS 0.2 MILE OR LESS IN LENGTH.

FIGURE 9

SYMMETRICAL CUL-DE-SAC WITH
2'-0" VALLEY GUTTER